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Clean Version of Pending Claims

HIGH PRESSURE ANNEALS OF INTEGRATED CIRCUIT STRUCTURES
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Serial No.: 09/761,355

Claims 42-43, 59, and 72-99, as of July 26, 2002 (date of response to first office action filed).

Sub C1 42. (Amended) An interconnect structure formed in a contact hole overlying a supporting substrate, comprising:

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a titanium silicide layer on the supporting substrate in the contact hole, wherein the contact hole has an aspect ratio of at least 2:1;

an aluminum plug fill, relatively free of voids, formed on the titanium silicide layer by a CVD process at a pressure of at least approximately 1.1 atmosphere; and

a metal line electrically coupled to and formed over the aluminum plug fill.

43. The interconnect structure of claim 42, wherein the metal line comprises aluminum.

59. (Amended) The integrated circuit of claim 72 wherein the aspect ratios of the contact hole and vias are at least 5:1.

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72. An integrated circuit comprising:

a substrate having circuitry formed therein;

a first insulating layer formed over the substrate;

a contact hole having an aspect ratio of at least 2:1 formed through the first insulating layer;

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an aluminum plug fill formed in the contact hole by a CVD process at a pressure of at least approximately 1.1 atmospheres, relatively free of voids, electrically contacting the circuitry;

a metal line electrically coupled to and formed over the aluminum plug fill; and

a plurality of further insulating layers having metal lines electrically coupled to lines on

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other insulating layers by aluminum plugs which are relatively free of voids and formed in vias having aspect rations of at least 2:1.

73. An interconnect structure formed in a contact hole overlying a supporting substrate, comprising:

a titanium silicide layer on the supporting substrate in the contact hole;

an aluminum plug fill, relatively free of voids, formed on [supported by] the titanium silicide layer by a CVD process at a pressure of at least approximately 1.1 atmosphere; and

a metal line electrically coupled to and formed over the aluminum plug fill.

74. The interconnect structure of claim 73, wherein the metal line comprises aluminum.

75. An integrated circuit comprising:

a substrate having circuitry formed therein;

a first insulating layer formed over the substrate;

a contact hole formed through the first insulating layer;

an aluminum plug fill formed in the contact hole by a CVD process at a pressure of at least approximately 1.1 atmospheres, relatively free of voids, electrically contacting the circuitry;

a metal line electrically coupled to and formed over the aluminum plug fill; and

a plurality of further insulating layers having metal lines electrically coupled to lines on other insulating layers by aluminum plugs which are relatively free of voids and formed in vias having aspect rations of at least 2:1.

76. The interconnect structure of claim 75, wherein the metal line comprises aluminum.

77. An integrated circuit comprising:

a substrate having circuitry formed therein;

a first insulating layer formed over the substrate;

a contact hole having an aspect ratio of at least 2:1 formed through the first insulating layer;

an aluminum plug fill formed in the contact hole by a CVD process at a pressure of at least approximately 1.1 atmospheres, relatively free of voids, electrically contacting the circuitry;

a metal line electrically coupled to and formed over the aluminum plug fill; and

a plurality of further insulating layers having metal lines electrically coupled to lines on other insulating layers by aluminum plugs..

78. The interconnect structure of claim 77, wherein the metal line comprises aluminum.

79. A method for forming an interconnect in a contact hole defined by walls of an insulating material and a supporting substrate, comprising the steps of:

depositing titanium on the supporting substrate at the bottom of the contact hole;

depositing a titanium nitride layer on the walls of the contact hole and the supporting substrate;

annealing the supporting substrate to form titanium silicide between the supporting substrate and the titanium nitride layer;

filling the contact hole with a conductive material deposited on the titanium nitride layer by a CVD process, utilizing a pressure of at least approximately 1.1 atmospheres; and

forming a metal line on the conductive material over the contact hole.

80. The method of claim 79, wherein the contact hole has an aspect ratio of at least 2:1.

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81. A method for forming an interconnect in a contact hole defined by walls of an insulating material and a supporting substrate, comprising the steps of:

depositing titanium on the supporting substrate;

annealing the supporting substrate;

filling the contact hole with a conductive material by a CVD process, utilizing a pressure of at least approximately 1.1 atmospheres the depth of the contact hole being at least twice the diameter of the contact hole ; and

forming a metal line on the conductive material over the contact hole.

82. The method of claim 81, wherein the contact hole has an aspect ratio of at least 2:1.

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83. The method of claim 81, wherein the annealing step comprises annealing in a processing chamber having an inert gas ambient.

84. The method of claim 81, wherein the annealing step comprises annealing in a processing chamber having a nitrogen-containing ambient.

85. The method of claim 81, wherein the conductive material comprises aluminum.

86. The method of claim 81, wherein the conductive material comprises tungsten.

87. A method for forming an interconnect on the bottom of a contact hole in a supporting substrate comprising silicon, comprising the steps of:

depositing titanium on the bottom of the contact hole in the supporting substrate to a thickness of approximately 500 to 2000 angstroms; and

annealing the supporting substrate in a processing chamber at a pressure of at least approximately 1.1 atmospheres and a temperature of less than approximately 700 degrees

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Celsius to form titanium silicide directly on the supporting substrate; and

filling the contact hole with a conductive material deposited on the titanium nitride layer by a CVD process, utilizing a pressure of at least approximately 1.1 atmospheres.

88. The method of claim 87, wherein the processing chamber contains an inert gas ambient.

89. The method of claim 87, wherein the processing chamber contains a nitrogen-containing ambient.

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90. A method for forming an interconnect in a contact hole defined by walls of an insulating material and a supporting substrate, comprising the steps of:

depositing titanium on the supporting substrate at the bottom of a contact hole;

depositing a titanium nitride layer on the walls of the contact hole and the supporting substrate;

annealing the supporting substrate to form titanium silicide between the supporting substrate and the titanium nitride layer;

forming a tungsten plug in the contact hole directly on the titanium nitride layer by a CVD process at a pressure of at least approximately 1.1 atmospheres; and

forming a metal line on the tungsten plug over the contact hole.

91. The method of claim 90, wherein the contact hole has an analysis ratio of at least 2:1.

92. The method of claim 90, wherein the titanium is deposited to a thickness of approximately 500 to 2,000 angstroms.

Sub C1 93. The method of claim 90, wherein the titanium nitride is deposited to a thickness of approximately 30 to 300 angstroms.

94. The method of claim 90, wherein the processing chamber contains an inert gas ambient.

95. The method of claim 90, wherein the annealing step is performed at a temperature of less than approximately 700 degrees Celsius.

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96. The method of claim 90, wherein the tungsten plug is formed by depositing tungsten and force-filling the deposited tungsten into the contact hole at a pressure of at least approximately 1.1 atmospheres.

97. The method of claim 90, wherein the tungsten plug is formed by depositing tungsten using chemical vapor deposition at a pressure of at least approximately 1.1 atmospheres.

98. The method of claim 90, wherein the metal line comprises aluminum.

99. The method of claim 90, wherein the metal line has a thickness of approximately 2,000 to 5,000 angstroms.